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AUTHOR Anderson, Lorraine Kvistberg
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ABSTRACT

A research project explored the idea that reasoning develops in distinct phases of thinking as individuals journey from simplistic learning of facts to highly proficient consequence predicting of integrated relationships. These results were derived from a study that examined the thinking processes and problem-solving actions of 13 students and faculty from a land grant university housing program. Two separate but integrated investigations used a questionnaire in which subjects were asked to reason about current housing problems and factors that influence housing selection. During the problem-solving activity, subjects were instructed to verbalize all their thoughts as they solved four housing-related problems. Findings revealed differences in the understanding and meanings inferred by individuals at varying levels of learning as they sought to interpret and resolve housing selection problems. These findings suggest that reasoning develops in a stage or phase progression of acquiring specific knowledge about a subject matter, followed by the ability to associate meaning with facts, and finally reasoning about the results of actions and the testing of consequences of these actions. The theory of phases of reasoning has direct implications for housing program design and instruction. Instruction could incorporate housing selection activities that allow for predicting consequences of varied alternatives as a means for developing and practicing reasoning abilities. (20 references) (Author/KC)

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Stages of Reasoning Along a Developmental Continuum: Implications for Instruction of Housing Programs

Lorraine Kvistberg Anderson, Ph.D.
Research Associate
University of Minnesota, St. Paul

Abstract

This research explored the notion that reasoning develops in distinct phases of thinking as individuals journey from simplistic learning of facts to highly proficient consequence predicting of integrated relationships. The results reported here were derived from a study which examined the thinking processes and problem solving actions of 13 students and faculty from a land grant university housing program.

Findings revealed differences in the understandings and meanings inferred by individuals at varying levels of learning as they sought to interpret and resolve housing selection problems. These findings suggest that reasoning develops in a stage or phase progression of acquiring specific knowledge about a subject matter, followed by the ability to associate meaning with facts, and finally reasoning about the results of actions and the testing of consequences of these actions.

Phases of reasoning has direct implications for designing and instructing programs. Instruction that incorporates housing selection activities which allow for predicting consequences of varied alternatives as a means for developing and practicing reasoning abilites are constructed.

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Stages of Reasoning Along a Novice-Expert Continuum: Implications for Instruction of Housing Programs

Lorraine Kvistberg Anderson
Research Associate
University of Minnesota, St.Paul

Introduction. Changes in the social and economic fabric of our society are challenging the social, psychological, and physical well-being of individuals and families (Bratt, Hartman, & Meyerson, 1986; Gitman, 1986; Gitman & Joehnk, 1990). Increasingly complex and less predictable resources, such as housing, place special cognitive demands upon individuals and families as they deal with unfamiliar situations and problems trying to make sense of change. Insight into how individuals develop thinking processes and proceduralize technical, economic, and legal knowledge appears to be useful when reasoning about and making sound judgments concerning housing and its consequences in a global environment. This study examined the relationship between knowledge structures and content, and the reasoning processes of novices, intermediates and experts engaged in solving housing selection problems. Implications for structuring instructional programs that enhance reasoning competence in solving everyday life problems as housing selection were explored.

Theoretical framework. A growing body of literature on teaching critical thinking and problem solving has concentrated largely on well-structured classroom situations (Chi, Feltovich, & Glaser, 1981; Larkin, McDermott, Simon, & Simon, 1980; Newell & Simon, 1972; Sternberg, 1985). Less is known about how individuals represent and reason about problems that occur in real-life everyday situations (Rogoff & Lave, 1984; Resnick, 1987). Although cognitive research has indicated that successful problem solving performance requires extensive, readily accessible knowledge that can be applied to the problem situation and the ability to make sound judgments for intended goals and subsequent consequences (Anderson, 1985; Glaser, 1986; Kerka, 1986), there is limited understanding of how individuals develop reasoning abilities when confronted with real-life problems such as housing selection in a changing world.

Expert-novice studies indicate that individuals develop thinking processes and proceduralize knowledge in qualitatively different ways (Dreyfus & Dreyfus, 1986; Glaser, 1986; Patel & Groen, 1988), including more efficient organization of knowledge(Marshall, 1988), and the ability to infer more from less information (Dillon & Schmeck, 1983). Stage progression of reasoning along a novice-expert continuum is presumed to change with amassed knowledge and practical experience or training (Carey, 1985; Dreyfus & Dreyfus, 1986; Patel & Groen, 1988).

Recent research efforts which describe problem solving that affect families and their housing concerns have focused upon interdisciplinary relationships among homes, neighborhoods, and the well-being of people and their communities (White, 1986). A theoretical perspective that accomodates both ill-structured nature of everyday problem solving by individuals and families and stage progression of reasoning conceptualizes the ability to reason about housing concerns as an integrative holistic system of interacting personal and external forces. Instruction that incorporates housing selection activities which allow for predicting the consequences of varied alternatives as a means for developing and practicing reasoning abilities will be constructed.

Methods. Students and faculty at three levels of expertise (novice beginners, intermediates, and experts) from a land grant university home economics housing program formed the data base. Subjects were selected on the basis of two criteria: a) personal and professional housing experience and b) housing domain knowledge. Two separate but integrated investigations used a questionnaire,

procedures. Subjects in each of the two investigations were asked to reason about current housing problems and factors that influence housing selection. During the problem solving activity subjects were instructed to "think aloud"(Ericsson & Simon, 1984), or to verbalize all their thoughts as they solved four housing related problems. Differences in the organization of subjects' thinking and reasoning processes were assessed. Data were analyzed using descriptive and nonparametric statistics (Kruskal-Wallis one way analysis of variance) to quantify subject's content knowledge and to differentiate levels of expertise. Content and protocol analysis procedures (Ericsson & Simon, 1984) revealed quantitative and qualitative differences in knowledge organization and reasoning patterns during the problem-solving activity. Verbal reports were coded using an adaptation of Perkins' Knowledge as Design framework (1986) and Voss, Tyler, and Yengo's social argumentation model (1983) . Differences were plotted for illustrative purposes on cognitive process maps. Similarities and differences were compared among and within groups.

Results and Discussion. The results suggest that progression of reasoning develops along a continuum ranging from reasoning by recognition of physical descriptors, to identification of functional operators, and finally reasoning by making predictions about integrated relationships. Findings revealed significant differences among groups in proportion of concepts verbalized, achievement test scores, and in proportion of outcome and reasoning statements generated from interview sessions and the problem solving activity.

Novices based housing decisions on surface feature-based rules, and reasoned by comparing physical aspects of housing with family income and expense resources. Acquired domain knowledge is organized by labels, classification, and matching features. Validation of goals by novice subjects involved rule-based matching of housing features to family situation. These reasoning patterns are indicative of inexperience from lack of experience and acculumated knowledge of housing content.

Intermediate subjects linked individual and family needs with factors that influence housing within local communities. Intermediates reasoned by applying rules related to physical and economic factors. Reasoning about the functional meaning of housing and its impact upon its users was prevalent among intermediates, indicating understanding of concepts and association of relationships. Validation of goals included matching compatibility of families with potential housing selection actions. Intermediates expressed understanding by integrating functional relationships of housing, its users, and public affairs operating within local communities.

Experts based decisions upon interaction between families and broad contextual social, economic, physical, political, and cultural criteria. Experts reasoned about functions of housing, but also integrated relationships of global world contexts that impact housing decisions. Validation of intended goals was conducted using consequence testing procedures. Ability to anticipate and predict implications of varied housing situations that linked housing and its users with the community and the world at large existed among experts. These data suggest that as individuals learn more about the subject matter and practice direct application of acquired knowledge, principle-based hypotheses can be developed that aid in reasoning about and making judgments from a holistic approach.

These findings on the progression of reasoning suggest that as individuals acquire specific knowledge about a subject matter, the ability to associate meaning with facts increases along with capabilites to reason about the application and consequences of that knowledge. Novices at a classification level, attach labels to housing content and match features as a means of understanding and reasoning. Intermediates at the understanding level, associate meanings by linking concepts about events and phenomena as a means of understanding and reasoning about housing content. Experts at an anticipation level discriminate and apply housing relationships to varied problem situations and reason by making predictions about these relationships.

anticipation level discriminate and apply housing relationships to varied problem situations and reason by making predictions about these relationships.

Implications for Home Economics Education. These results have implications for sequential structuring of learning designed to facilitate the development of stages of reasoning. Reasoning may be structured by understanding domain knowledge ,what is?; associate meaning with facts, what does it mean? ; reasoning and applying knowledge to goals, where does this apply?; and reasoning about consequences of actions, what will the results be if, then? This stages of reasoning prototype provides insight for the design of instruction that makes reasoning explicit from a practical problem solving perspective. Stages of reasoning knowledge can be useful to help instructors and the learners themselves diagnose reasoning capabilities in order that movement can be made to higher levels of thinking and reasoning. Activities as paired problem solving, scaffolding instruction, and Socratic questioning would aid individuals in developing an understanding of the dynamics of housing in a changing environment.

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